

THE LEADING CAUSE OF DEATH OF FIREFIGHTERS

Executive Development

The Leading Cause of Death of American Firefighters in the 21st Century: A Study of the
Impact of Occupational Stress on Cardiovascular Disease

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that the appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

Unacceptable losses are encountered each year among firefighters in both the career and volunteer fire services. The problem is that firefighters are dying of a much preventable disease. Cardiovascular disease, including coronary artery disease and stroke, remains a major health problem and the East Derry Fire Department does not have a system in place to track the health and risk factors of its members.

There is emerging evidence that physical and psychological stress is a more potent risk factor for heart disease than once believed. The purpose of this research was twofold. First, it was important to investigate the causes and effects of stress on today's firefighters. The second purpose was to study the impact that stress has on the incidence of cardiovascular disease and investigate what elements need to be present in a comprehensive health and wellness program to reduce the effects of stress on the members of the East Derry Fire Department and firefighters across the country.

The descriptive research method was used to answer the following questions:

1. What stressors do firefighters encounter in the course of their daily lives?
2. What effects do those stressors have on their mental and physical well-being?
3. How does stress contribute to cardiovascular disease?
4. What support systems or training is necessary to recognize stress, reduce the impact of stress, and identify risk markers to prevent tragedies in the East Derry Fire Department?

An extensive literature review was conducted and two surveys were distributed to help answer the research questions. The results of the research supported the literature review findings showing that stress, if left untreated, can cause physical signs and symptoms and eventually

physiological changes which may contribute to cardiovascular disease.

Recommendations included a comprehensive health and wellness program using NFPA Standards as guidelines, to track the health of firefighters, and give them opportunities for physical fitness training, stress education, and stress management. Also, CISD and employee member assistance programs were recommended.

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The Leading Cause of Death of American Firefighters in the 21st Century:

A Study of the Impact of Occupational Stress on Cardiovascular Disease

For at least the last twenty years studied, the leading cause of death of firefighters in the United States has been heart attacks and other forms of cardiovascular disease, such as stroke (United States Fire Administration [USFA], 2002). In fact, almost half of all firefighter fatalities result from heart attacks unlike any other physically demanding occupation in America. The trend over the last 20 years for percent of deaths due to some form of cardiovascular disease has ranged from approximately 35% to 53% of all deaths. The occurrence of this fatality rate, though, is age dependent, causing 34% of annual deaths in the 36-40 year age group and rises to 76% in the 56-60 year age group.

As reported by Brooks, Parsons-Nicota, and Richardson (1998), much evidence is emerging which points to occupationally-induced stress as a significant cardiovascular disease risk factor for members of today's fire service. The men and women working in firehouses across the country, both career and volunteer, encounter occupational stress in a variety of forms. Physical stressors, such as heat stress, strain and exertion, and sleep deprivation, and psychological stressors, including post traumatic stress disorder, if left untreated, can play a significant role in the incidence of cardiovascular disease.

Unacceptable losses are encountered each year and the problem is that firefighters are dying of a potentially preventable disease. Cardiovascular disease, including coronary artery disease and stroke, remains a major health problem among firefighters and the East Derry Fire Department (EDFD) does not have a system in place to track the health and risk factors of its members. Because there is emerging evidence that physical and psychological stress is a more potent risk factor than once believed, the purpose of this research is twofold. First, it is important

to investigate the causes and effects of stress on today's firefighters. The second purpose is to study the impact that stress has on the incidence of cardiovascular disease and investigate what elements need to be present in a comprehensive health and wellness program to reduce the effects of stress on the members of the EDFD and firefighters across the country.

The researcher will perform an extensive literature review, gather self-reports from firefighters through questionnaires, and use the descriptive research method to answer the following questions:

1. What stressors do firefighters encounter in the course of their daily lives?
2. What effects do these stressors have on their mental and physical well-being?
3. How does stress contribute to cardiovascular disease?
4. What support systems or training is necessary to recognize stress, reduce the impact of stress, and identify risk markers to prevent tragedies in the EDFD?

Background and Significance

According to the U.S. Bureau of Labor Statistics, firefighting, as a profession, causes a higher occurrence of occupationally-related illnesses and injuries than any other career. Many sources substantiate the fact that the leading cause of firefighter fatality is cardiovascular disease and heart attack. The most alarming statistic, to this researcher, is the fact that the yearly firefighter heart attack death rate is greater than in any other high-stress, physically challenging occupation (Moore, 2003). This data leads to several questions, the foremost being; what factors and situations exist, germane to the fire service, which are causing this disquieting trend in firefighter deaths, and how does the EDFD, both past and present, weigh against the statistics

for firefighter deaths, cardiovascular disease and heart attack?

The East Derry Fire Precinct is a fire district located within the geographical boundaries of the Town of Derry, New Hampshire. Currently, the Town of Derry is inhabited by approximately 36,000 residents who are served by two different fire organizations. The Town of Derry Fire and Ambulance Service covers 48% of the Town geographically but is responsible for two-thirds of the residents and a large portion of the commercial base. The EDFD covers 52% of the area of the Town which consists primarily of single family residences, light commercial, retail, schools and churches. The EDFD employs a Chief, a Deputy Chief, 18 full- time, career Firefighter/ EMTs including line officers, 15 Call Firefighters/ first responders, and 2 administrative assistants. The Precinct is governed by a Board of three Fire Commissioners who provide fiscal direction to the Chief and are responsible to the taxpayers of the Fire District. For the past 30 years, the Town of Derry politicians have been trying to force a consolidation of the two departments. The East Derry Fire Precinct taxpayers, who ultimately have the final say in that decision, have repeatedly voted against such a move at annual meetings. Twice over the last 15 years, the Town Department “took over” a segment of the East Derry district. Both times the issue went to court; East Derry prevailed and resumed service in the areas in question. Most recently, the Town changed boundaries again and this time removed 54% of the East Derry district citing an RSA which they interpreted as having the authority to do so. This issue, once again, is in the court system, but in the mean time, East Derry Fire Station 2 has been closed because it now is in the “new” Town of Derry Fire response area. One can imagine the effect that this scenario has on the firefighters of the East Derry district. There are, again, talks of layoffs, talks of dissolving the district, and talks of long, drawn out court battles. These actions have prompted some of the personnel to search for jobs with other departments. The majority of the

firefighters, however, have remained loyal to the precinct and deal directly with the stress of issues such as job security, pressure from politicians, constant questioning from the public they serve and harassment from the members of the other town department. This entire set of circumstances, which contribute considerably to the organizational stress, combined with the other types of occupational stress encountered by most firefighters, prompted this area of research. This researcher has witnessed a large percentage of personnel taking several sick days (many firefighters describe these as “mental health” days). Also, firefighters report issues such as sleep problems, digestive problems and extreme fatigue. This research paper examines how firefighters in the EDFD have been affected by stress in the past and present and will also examine the impact on their health and well being, particularly in the area of cardiovascular disease. The results of the research will allow myself and others to look at ways of tracking the health and risk factors of the personnel, and, if necessary, establish a health and wellness program to include elements to reduce the effects of stress which can lead to serious illness and even death.

The National Fire Academy Executive Fire Officer Course, *Executive Development*, teaches ways for the student to lead and manage change and also to conduct research and apply the findings to their own organization. This participant intends to utilize the results of the research to explore the need for a program to examine occupational stress and, if necessary provide training and elements to improve the health of the members of the EDFD to prevent tragedies in the future and improve the overall effectiveness of the organization. In addition to being linked to the *Executive Development* course, this research directly represents one of the five main program goals of the USFA. “One of the USFA’s main program goals is a 25-percent

reduction in firefighter fatalities in 5 years and a 50- percent reduction within 10 years” (USFA, 2003, p.1). This research project is significant to the EDFD as it allows us to examine occupational stress and firefighter fatality statistics and use this information as a catalyst for change.

Literature Review

An extensive literature review was conducted to research the data, facts and information that have been written about this researcher’s particular area of study. This review included a search of firefighter fatality reports from many sources, medical journals, fire service magazines and textbooks, Psychological journals and textbooks, and internet articles. This literature review added a more thorough understanding of what is meant by “stress”, what types of stress do firefighters encounter, how does this stress effect firefighters, and what relationship does high levels of stress have on the incidence of cardiovascular disease in the fire service. This review section includes discussion on findings in the following topics:

1. Definition of Stress
2. Health Effects of Stress
3. Firefighter Fatality Data
4. Risk Factors of Cardiovascular Disease
5. Stress Management Practices

Definition of Stress

“...stress is defined as the body’s response to situations that pose demands, constraints or opportunities, “(Bryce, 2001, p.2). Stress can be more completely defined as a natural response to a perceived threat, change or challenge with several components including physical, cognitive and/or emotional arousal (Salvesen, 1996). Consequently, stressors are those stimuli that

generate a stress response. It is important to note here that literature makes a vital distinction between two different kinds of stress. The first type, called “dystress”, is a situation in which stress has been pushed beyond reasonable limits. The second type of stress, termed “eustress”, is that part of everyday life that energizes and motivates us and is essential to our well-being. The difference between dystress and eustress differs from person to person due to the individual’s ability to deal with stressful situations. The stress that energizes, stimulates and raises performance levels for one person, may harm another. At any given time, eustress can diminish into distress changing enthusiasm into despair. This is when stress becomes harmful and causes wear and tear on an individual and an inability to cope with stressors.

Before discussing how stress affects the body, it is important to look at what stressors firefighters are subject to. Each and every person, regardless of age or occupation, encounters some degree of daily stress. Whether you are running late for work, forgot your homework, your car wouldn’t start or you are caught in a rain storm without an umbrella, you are coping with small amounts of stress that are considered a normal part of a routine day. Situations exist, exclusive to the fire service that can cause damage to our well-being emotionally, physically and socially.

America’s firefighters are not excluded from the wear and tear of living in present-day society. In addition to shouldering the effects of daily stress, firefighters are subjected to a great number of unusually powerful and destructive stressors unique to their work. These stressors include but are not limited to: environmental hazards, such as noise, deadly gases and building collapse; organizational factors, such as various staffing, leadership, training and scheduling policies; and psychological stressors, such as death, trauma, and mass casualties, to name just a few (USFA, 1991).

Edward Dickinson, MD, EMT-P, describes the effects of heat-related stress and lack of proper on-scene rehabilitation. Appropriate emergency scene rehabilitation, including medical monitoring, rehydration and interventions to reduce the risk of heat stress, varies widely among departments based on local training, operating procedures and logistics. This is an important point considering firefighters are dying of stress and heat-related illnesses more frequently than from structural collapse, burn injuries or other fireground causes. The EDFD currently does not have a formal guideline for fireground rehabilitation.

Cyralene P. Bryce discusses the concept of traumatic stress and how it can be severely detrimental to an individual's health. She describes a traumatic stressor as an event which is "outside the realm of normal human experience" (p. 10). Events that evoke reactions of horror, fear and helplessness, such as natural disasters, bodily assault, serious accidents, death of a child or a coworker, are all incidents that many firefighters are exposed to during their careers. Exposure to such stressors can cause effects that become chronic. This, in turn, can lead to a very intense response which overwhelms a firefighter's ability to cope. Posttraumatic Stress Disorder (PTSD) is the condition that results when a firefighter's coping mechanism is overwhelmed.

In the fire service, we encounter a myriad of physical stressors which can ultimately result in illness. Carcinogenic agents, toxins and elevated noise levels are inherent in the fire service as we respond to incidents. Other physical stressors include sleep deprivation from long work hours and interrupted night shifts, dehydration, hypothermia, and of course, the actual physical strain and exertion of performing the act of firefighting wearing 60-70 pounds of equipment. Many times these acts are performed after periods of complete rest or after a large meal with very little time to prepare or adjust to a needed burst of energy to perform intense

physical activity. Another example of a physical stressor a firefighter is sure to encounter falls under the category of rapid onset stressors. “Examples include a sudden bright flash of light, unexpected blaring noise or a sharp pain. A good example of a frequently occurring rapid onset stress in the fire service is the fire alarm” (USFA, 2001).

Many studies on occupational stress found that organizational factors, for some fire service personnel, cause more stress than aspects related to their normal duties. In a study of emergency service workers, “...sources of stress include rotating shift work, interference with family life and fear of contracting a disease such as HIV/AIDS or hepatitis” (International Labor Organization, 2004). Other organizational stressors include concerns regarding job security, wages and benefits, leadership conflicts, management/labor conflicts and job skill concerns. The ‘life-and-death responsibility’ of firefighters, for both the public they serve and for their fellow crew members, can cause a significant amount of stress over a firefighter’s career and is considered a cumulative stressor. Other examples of cumulative stressors include lack of promotion opportunity, poor work conditions and excessive paperwork. Also, a high number of “runs” or incidents can lead to “burnout” and a lack of “runs” can lead to “rust out”(Salvesen, 1996).

In conclusion, the literature review confirmed that although not all types of stress are detrimental, there continues to be a host of sources of daily life and occupational stressors that affect firefighters mentally, socially and more importantly, physically.

Health Effects of Stress

Back in 1946, the World Health Organization adopted the following definition of health: “Health is a state of complete physical, mental, and social well-being and is not merely the absence of disease or infirmity” (Sigerist, 1941). Sigerist, a historian of medicine, goes on to

say” Health is...not simply the absence of disease: it is something positive, a joyful attitude toward life, and a cheerful acceptance of the responsibilities that life puts upon the individual” (p.). In order to research how stress affects a firefighter’s health, it was necessary to understand how health is defined. An additional definition was found in Funk & Wagnalls Standard Desk Dictionary (1996) “Freedom from defect or disease...indicative or characteristic of sound condition”. (p. 296)

In reviewing literature sources, several were found that discuss how stress affects the health of an individual and more specifically, firefighters. As mentioned earlier, stress can be positive, keeping us alert and ready to react to our environment. Stress that becomes chronic or continues without relief becomes distress which disrupts the body’s internal equilibrium (Kiffer, 2002). In the general population, 43% of all adults suffer adverse health effects from stress and 75-90% of all doctor’s office visits are for stress related ailments. Stress is a hazard of the workplace causing absenteeism and reduced productivity, and costing American industry more than \$300 billion annually.

Hans Selye, MD, a physiologist and leading researcher in the field of stress, describes three predictable phases of stress(1976). The first, being the alarm stage, prepares a person to experience a threat or challenge. This is otherwise referred to as the fight-or-flight response and is the phase in which a person encounters physiological changes typical of the first exposure to a stressor. Symptoms can vary from person to person and event to event but may include fear, panic, anxiety, increased heart rate, increased blood pressure, digestive ailments, headaches and muscle tension. The second stage, sometimes called the resistance stage, is the phase in which the body may recover from the physical strains of the alarm stage or, if the stressor continues, the body enters a stage of energy conservation. Symptoms of this phase include narrowing of

interests, withdrawal, tardiness, denial of feelings and poor productivity. The third stage, the exhaustion stage, is reached only when an individual continues in the alarm stage or experiences the alarm and resistance stages too often. This stage is often referred to as “burn out” and is a reaction to continued metabolic demands from the first stage. In this stage, the body is vulnerable to illness, disease and in severe cases, death. Warning signs and symptoms of this stage are severe and may include loss of self-confidence and hopelessness, poor sleep habits, unusual behavior, and in extreme cases, homicidal thoughts. Physical problems, such as depression, nervous tics, ulcers and hypertension are not uncommon in an extended exhaustion stage.

Victims of stress generally begin to exhibit certain symptoms or signs of stress and it is important to be able to identify this wide range of reactions. The literature review found numerous reports on signs and symptoms of stress. The following is a compilation of reactions that occur as,”... a way of the body telling you to slow down, take it easy, and get rid of whatever is causing the tension” (Hafen & Frandsen, 1985, p. 378)

Physical signs of stress.

- Increased heart rate
- Elevated blood pressure
- Dizziness/fainting
- Chest pain
- Nausea/vomiting
- Difficulty breathing
- Fatigue/weakness
- Sexual dysfunction
- Visual, hearing, or speech difficulties

Cognitive signs of stress.

- Loss of self-confidence
- Memory impairment
- Racing thoughts
- Loss of time and place orientation
- Disturbed thinking
- Blaming others
- Difficulty making decisions
- Poor concentration and abstract thinking

Emotional signs of stress.

- Feeling overwhelmed
- Hopelessness
- Guilt
- Grief
- Apathy and depression
- Fear and anxiety
- Anger and agitation
- Denial

Behavioral signs of stress.

- Sleep disturbances
- Change in eating habits

- Antisocial behavior
- Hyper arousal
- Chronic fatigue
- Accident proneness
- Substance use/abuse
- Change in activity levels
- Erratic movements
- Irrational/impulsive behavior

Each firefighter in the EDFD and across the country is different relative to how they are affected by stressors. The physiology, or the body's response to those stressors, however, is nearly one and the same for everyone. Both the nervous system and the endocrine system respond to stress. Stress produces a myriad of physiological changes in the body which ultimately result in a reduced ability to fight infection and disease.

First, it (stress) causes hormones such as adrenalin and cortisone to be released into the bloodstream. Cortisone stimulates renin in the kidneys, causing blood pressure to skyrocket. It also causes small tears in the walls of the arteries; the tears are built up and repaired with cholesterol, which leads to hardening of the arteries and stress on the heart....And cortisone suppresses the immune system, leading to increased risk of infection and general disease (Hafen & Frandsen, 1985, p. 353).

Stress can be referred to as a neuroendocrine response because the electrical activities of the brain are followed by chemical and mechanical activity of our glands and muscles. This chain reaction is often referred to as the "Mind/Body Connection". During extremely stressful events, such as the loss of a fellow firefighter, the thyroid gland may release the hormone thyroxine. The

effects of this hormone can last in our bodies for up to eight weeks increasing the body's complete metabolic rate as much as 60% to 100 %. The net side effects of increased metabolism include fine muscle tremors, increased core temperature and most alarmingly, decreased heart strength and increased probability of cardiac failure (USFA, 1991). Diseases, such as atherosclerosis, can result when the physical effects of stress continue untreated for an extended period of time. Many sources in literature have reported that prolonged stress affects increase disease susceptibility and decrease healing potential. Finally, during stressful event adrenalin, a major stress hormone, is released when the sympathetic nervous system is activated. Adrenalin has been shown to cause damage to artery linings and directly to the heart tissue itself.

As reported in USFAs publication, *Stress Management: Model Program for Maintaining Firefighter well-Being*, a researcher by the name of R.J. Barnard, studied the effects of occupational stress on members of the fire service. He researched, "to determine whether fire service job stress is implicated in the high incidence of heart disease and concluded that there exists a causal relationship between fire service occupational stress and heart disease" (p. 29). In addition, International Association of Firefighters (IAFF) data show that cardiovascular disease remains the largest contributor to disability retirements from line-of-duty illnesses in firefighters and causes the highest incidence of line-of-duty fatalities (1998).

In summary, the often intense stressors encountered in the fire service have been shown to have an adverse affect on the health and well-being of our members. We have little control in reducing the actual stressful events, but recognizing the ravaging effects that stress has on our bodies, can prompt actions to help reduce the effects of stress, By being proactive and able to understand and manage stress we may begin to take care of the fire service's most important resource: it's people.

Firefighter Fatality Data

Studying literature on firefighter fatalities, this researcher used such sources as the National Institute for Occupational Safety and Health (NIOSH), the USFA, the IAFF, the National Fire Protection Association (NFPA), and several fire service magazines. Sources indicate that the overall firefighter fatality statistics have remained somewhat constant over the last 10 years. The largest toll on firefighter lives, however, continues to be the result of cardiovascular disease and heart attacks. In fact, last year (2003) there was a slight increase in the number of fireground deaths. “All told, 105 firefighters died while on duty in 2003, up from 97 in 2002... Stress and overexertion remained the leading cause of fatal injury in 2003,” (NFPA, June, 2004). As reported, last year 47 firefighters died from a stress-induced heart attack which is nearly 10 percent more than the average number over the past 10 years studied. What this researcher finds distressing is that studies, without fail, find approximately half of the victims of fatal fireground heart attacks had a previous history of blocked arteries, bypass surgery, heart attack events and poor medical screening results.

The USFA has been tracking and analyzing firefighter fatalities for the past 28 years. The main focus has been to determine the causes of the deaths and direct attention to exploring ways of decreasing the incidence of firefighter fatalities in the years to come. Areas of fatality study include nature of fatal injury, cause of fatal injury, type of activity involved in at the time of death, time of the day, month of the year, area of the country where deaths occurred, and the ages of the deceased firefighters (USFA, 2003).

The USFAs report *Firefighter Fatality Retrospective Study 1990-2000* (2002), acknowledges that, “The leading nature of fatal injuries to firefighters is heart attack (44 percent)” (p.1). Other areas studied in this report include trends in firefighter fatalities, types

of fire agencies, the rank of those firefighters involved in deaths, the type of duty being performed, and of course, the cause of the fatal injury. The results of this 10 year study are consistent with other studies found in the literature review.

Heart attacks are the leading cause of firefighter fatalities. The physical demands placed on firefighters can be very high and they often have to go from a state of deep sleep to near 100 percent alertness and high physical exertion in a matter of minutes. Further, they must carry heavy equipment through intense heat while wearing heavy gear. Due to the physical demands of firefighting, firefighters must maintain a high level of physical fitness (USFA 2002).

All sources were consistent in their findings in that the total number of firefighter fatalities averaged approximately 100 per year. The average percent of the fatal injuries due to heart attack has also remained consistent at approximately 42% - 46%. The United States Fire Administration has been vigilant in reporting firefighter fatality data, and the result of the studies has not shown a downward trend in cardiovascular disease related deaths. If such a high percentage of deaths were attributed to breathing apparatus failure or bunker gear failure, there would be an outcry from department leaders and Union leaders to the equipment manufacturers insisting that changes be made to provide safer equipment and reduce the number of fatalities. "We purchase the finest equipment available; we allocate time and money to better train our men and women so they can survive in dangerous atmospheres. Are we falling short of what really needs to be done to slow the propensity for heart disease?" (Smith, 2002, p.1)

NIOSH conducts a *Fire Fighter Fatality Investigation and Prevention Program*. This program was instituted to help determine aspects which play a role in line-of-duty firefighter deaths. In a report dated March 13, 2003, a 43 year old male firefighter collapsed after

performing fire suppression duties at a residential house fire. “Atherosclerotic and hypertensive cardiovascular disease and pulmonary emphysema were found on autopsy. The death certificate listed cardiac arrhythmia as the cause of death” (NIOSH, 2003, p.1). Also, in 2002, 2 young firefighters, ages 27 and 28, suffered line-of-duty deaths caused by fatal heart attacks. Literature advises that, in the ten year period studied, the percentage of deaths from heart attack and cardiovascular disease increases steadily after the age of 35 accounting for 34% - 78 % of total deaths (USFA, 2002). It is incorrect to think that firefighter heart attack deaths are a phenomenon for aging firefighters. In fact, 44% of reported heart attack deaths among firefighters took place in the population with ages ranging from 26 to 50 years (Hayes, Jr., 1998). Finally, as stated earlier but worth mentioning again, firefighting as an occupation, kills more members annually from cardiovascular disease than any other occupation in America.

In summary, it is well known that firefighting is a stressful and sometimes dangerous profession. Situations exist, while performing our duty that are beyond our control and can cause catastrophic results such as, building collapse while performing a rescue, or a sudden change in wind direction while performing wildland firefighting. However, firefighters dying in high numbers from cardiovascular disease related illnesses is a statistic we shouldn't accept.

Risk Factors of Cardiovascular Disease

Cardiovascular disease (CVD) includes abnormal conditions of the heart, arteries, and veins that supply oxygen to vital life-sustaining areas of the body. The brain, other vital organs and even the heart itself will die if oxygen doesn't reach the tissues. Heart disease occurs when there is an obstruction of the blood flow to the heart. Generally, this happens as a result of excess fat or plaque deposits narrowing the veins that supply the oxygenated blood to the heart muscle. Excess plaque or cholesterol buildup is called atherosclerosis which is the most common risk

factor for sudden cardiac death. Sudden cardiac death, otherwise known as myocardial infarction or heart attack, can result in death or cause an incapacitating condition for an individual depending on the area of the heart damaged and the amount of myocardium that is affected. Another condition, known as arteriosclerosis, is an advancing thickening and hardening of the coronary arteries which also decreases the ability of the oxygen to reach the heart muscle during times of increased need such as exercise or stressful events (Choi, 2000; USFA, 2002).

Risk factors are traits and lifestyle habits that can increase the likelihood of contracting a certain disease (American Heart Association [AHA], 2004). The risk factors for CVD can be separated into two general categories; those that can be modified or treated and those that cannot. The greater the number of risk factors for a particular disease that an individual has, the higher the probability of getting that disease.

Risk factors that can be changed

- Smoking
- High cholesterol levels
- High blood pressure
- Diet and nutrition
- Weight management
- Physical activity
- Stress management
- Diabetes
- Excessive alcohol use

Risk factors that cannot be changed

- Heredity
- Gender
- Nationality
- Congenital factors
- Age

Also included in CVD is the condition known as stroke. A stroke occurs when there is a marked decrease or sudden blockage of oxygen to the brain causing paralysis to an area of the body or even death. Many of the risk factors for stroke are the same as those for heart disease.

The foremost risk factor for heart disease and coronary artery disease remains tobacco use. According to USFAs publication *Physical Fitness Coordinator's Manual for Fire Departments*, the risk associated with cigarette smoking and tobacco use is correlated to the number of cigarettes smoked and the length of time an individual has smoked (1990). Smokers have been shown to have elevated carbon monoxide levels in their blood and this is known to lead to chronic coronary artery obstruction. Firefighters who smoke cigarettes more than double their chances of dying from heart disease than non-smokers, according to many literature sources.

Elevated cholesterol level is another grave risk factor that can result in both acute and chronic obstruction of the arteries of the heart. In firefighters, elevated cholesterol continues to be the most common lab aberration found during medical evaluations. Other common abnormalities found in firefighters during evaluations include elevated blood sugar levels and high blood pressure. High blood pressure, otherwise known as hypertension, if left untreated, can damage the arteries and the heart itself. Elevated blood sugar levels, caused by diabetes, is

considered a metabolic disorder in which carbohydrates can not be properly metabolized causing the body to use fat for energy. This results in an increase in lipid levels in the blood. Maintaining poor eating and nutrition habits can also contribute to heart disease by causing obesity and high cholesterol levels. Also, using alcohol in high amounts over a period of time can be fatal as it can lead to many disease processes including heart disease. It has been shown to produce irregular heartbeats, which can lead to high blood pressure, stroke and eventually heart failure. Exercise and physical fitness, or lack of, as in a sedentary lifestyle, can be a key risk factor for heart disease. "...physically active individuals who suffer a heart attack have a greater survival rate than physically inactive individuals. Sedentary lifestyle has been linked with hyperlipidemia and hypertension. Sedentary individuals also tend to suffer from greater incidence of obesity and tend to manage stress less successfully" (USFA,1990, p.5-5).

Many literature sources were used when researching stress as a risk factor for CVD. It is important to differentiate between physical stress and emotional or psychological stress because they vary in how they contribute to heart disease. Physical stressors are inherent in the fire service. Research has shown that the physical stress of the job makes firefighters more prone to heart disease. Even a "room-and-contents" structure fire can be dangerous to the health of members of the fire service who aren't prepared. Studies have been conducted to look at blood chemistry levels after members participated in live-fire drills. The relationship between firefighting activities and fluid and electrolyte levels was researched and it was determined that dehydration was very common. Even 90 minutes after the evolution and after rehydration attempts, base line levels of fluid balance were not reached. This dehydration combined with increased demand on the heart; that is the heart is pumping faster and harder, causes heat stress. Continuous heat stress encounters can damage the heart muscle.

When the cardiovascular system encounters heavy demands such as muscular work, heat stress or a combination of both, the vital organs require more blood. In fact, at the very time when the demand is the greatest, or when a large amount of blood flow is needed since the challenged firefighter is performing heavy muscular work and under heat stress conditions, the hearts pumping capacity is impaired (Risk Management, 2003, p.3).

This cardiovascular strain from heat stress contributes to the risk of a heart attack through insufficient blood flow to the heart. The climate inside of bunker gear during fire operations can be very stressful to firefighters. In general, the gear that is intended to keep heat out, also keeps heat in because it impairs heat loss. The heart is under greater strain because not only do the hard working muscles need an adequate amount of oxygenated blood, but the body's heat dissipating mechanism requires an increased blood flow. This scenario results in a near maximal heart rate causing severe strain on the cardiovascular system.

Physical stress in the form of exercise is generally good for you. Exercise, in moderation, and performed by a healthy individual, can cause the heart and lungs to work more efficiently. Fire fighting is a job that entails extreme periods of physical activity under rigorous conditions. Physical fitness, along with a good aerobic capacity, is essential for firefighters to be able to meet the burden of their profession. It is necessary for a firefighter to have above-average muscular strength and cardiovascular fitness, otherwise the physical stress of the job becomes a risk factor for CVD (Womack, Green & Crouse, 2000). In an article entitled *Hearts Afire*, the author discusses the heart rates of firefighters and how the alarm itself can contribute to heart disease. Within 15 seconds of an alarm, a firefighter's heart rate doubles and can be sustained at that rate for more than an hour. "Athletes in training usually get 15 minutes of warm-ups to raise heart beats that high" (Law, 2000, p. 78). Studies have shown that, in firefighting, the sudden

physical stress without a warm-up period, can cause a reduced blood supply to the heart causing a condition known as ischemia. Moreover, the increase in heart rate at the sound of an alarm was even more marked during night alarms. At the sound of an alarm, the cardiovascular system “gears up” for physical activity. At times, no physical activity takes place and there is a let down. However, the heart rate remains elevated for a long period of time. The nervous system is flushed with adrenalin preparing for a stress encounter and the adrenalin is not consumed or used up. This repeated cycle, in which stress hormones are released and not used during physical activity, can result in premature atherosclerosis becoming a risk factor for a heart attack.

Another physical stressor for firefighters, as mentioned earlier, is the exposure to toxins, such as carbon monoxide. Repeated exposure coincides with a higher occurrence of ischemia in firefighters which can result in angina, or a temporary lack of oxygenated blood to the heart muscle. This angina or chest pain can be a predecessor for a heart attack.

Finally, the issue of sleep deprivation or disturbed sleep patterns cannot be overlooked due to the fact that career, call and volunteer firefighters in the EDFD and across the country face this form of physical stress almost routinely. American fire departments vary in their personnel work schedules. Some firefighters work 24 hour shifts while others work 10 hour days and 14 hour nights, while others still, work 11 hour days and 13 hour nights. Some firefighters are on duty 42 hours per week while others work 48 and even 56 hours per week. Also, fire departments vary greatly in the number of runs or incidents that they respond to based on the number of personnel and population that they serve. The personnel of the EDFD work 24 hours on duty and 48 hours off duty which averages to be a 56 hour work week. Literature suggests that, in the long term, there are several consequences of routinely getting less than eight hours of continuous sleep. Even one interruption or modest sleep deprivation can lead to a decreased ability to

perform tasks that require coordination and thought. Many firefighters over the course of a week can have their sleep interrupted several times per night and two or more nights per week. This disrupted sleep pattern can result in a decrease in daytime alertness, a decreased ability to process information, and an increased sleepiness which contributes to a greater risk of occupational injury. Clinical consequences of sleep disturbances are associated with increased blood pressure, obesity, and an increased risk of stroke and heart attack. Also, chronic sleep deprivation over a period of time can result in an activation of the inflammatory system. Inflammation of this type changes the blood chemistry and can lead to atherosclerosis and heart disease.

This researcher found an extensive amount of literature that discussed emotional or psychological stress and its effects on our health. Emotional stress and its cohort, depression, play a role in giving rise to heart disease. In fact, recent heart research points to emotional stress as a more compelling risk factor for CVD than once considered (Brooks, et al., 1998). Members of the fire service are expected to tolerate a sustained level of crisis. Some events, however, are extremely powerful psychologically even for a seasoned member of the fire service. This event would be considered a critical incident which has the ability of producing a stress response. As noted earlier, there are some common and predictable signs and symptoms of this emotional stress response. Fatigue, insomnia, difficulty concentrating, memory problems, fear, guilt, depression and anger are some of the reactional symptoms of the emotional stress response. The endocrine system of the body causes the thyroid gland to release thyroxin in order to raise the body's metabolism during emotionally stressful times. Remember, the effects of thyroxin can linger for up to eight weeks. If this physical effect of stress goes unchecked for a prolonged

period of time a maladaptive response called psychosomatic disease can result. This is a physical disease which can cause actual tissue damage (Fogoros, 2004). High blood pressure, migraine headaches, and ulcers are all examples of psychosomatic illnesses. Emotional stress or critical incident stress if left untreated, can cause hyperventilation, hypertension and slow the recovery of the body from colds and other minor illnesses. The surge in adrenaline caused by severe emotional stress can cause many health hazards, the most critical being the damage that is caused to the lining of the arteries and to the heart tissue itself. Many literature sources also link emotional stress with alcoholism, drug use, depression, smoking, obesity and a number of mental health problems (USFA, 1991; Fogoros, 2004; AHA, 2004; Kiffer, 2002). Obesity and cigarette smoking, among others, are in themselves risk factors for CVD.

Finally, it is important to note that although emotional stressors are reported as being the most distressful for firefighters, not all firefighters respond to stress in the same way. Members of the fire service who exhibit Type A personalities, that is, quick to anger, competitive, impatient and having a need to do more things in less time, are more likely to develop CVD even in the absence of other risk factors (Hafen & Frandsen, 1985). As reported in *Psychological Emergencies & Crisis Intervention, A Comprehensive Guide for Emergency Personnel*, a study conducted by Rosenman and Friedman found that Type A men in the 39 to 59 year age group were three times more likely to suffer heart disease than the more relaxed Type B men. Astonishingly, in a younger age group, the Type A men were six times more likely to suffer from heart disease than their Type B counterparts.

In conclusion, we have no control over some of the risk factors for CVD such as age or heredity. An abundance of research shows the importance of modifying those factors which we can control; they are affecting our health and placing us at mortal risk.

Stress Management Practices

The activation of the bodies stress response, which has been shown to sometimes lead to physical illness and diseases, such as cardiovascular disease, follows a typical course and is generally the result of a chain of events (Shalev, 2000). Can that chain be broken? Is the propensity for heart disease an occupational hazard of the fire service that we can have control over? This researcher studied an overwhelming amount of evidence in the literature that reveals preventative measures that have been shown to reduce the risk of on-the-job heart attacks and sudden cardiac arrest among firefighters.

The term stress management refers to those techniques, activities or tactics that have been shown to lessen or eliminate stress reactions and improve the quality of life- if not even save it. Stress can not and should not be totally eliminated from life. The idea behind stress management is to keep yourself at a level of stimulation that is enjoyable and healthy. NFPA 1500 recommends that a wellness program that addresses both the emotional and physical effects of stress be implemented into fire departments and be available to all members (Chapter 9, 1997). This wellness program should provide the tools and programs necessary to build a healthy department. Also, Chapter 10 of NFPA 1500 addresses the need for a Critical Incident Stress program. Some topics recommended by NFPA in addition to stress management include weight control, healthy heart, hypertension, nutrition, substance abuse and smoking cessation. “At the incident scene or in any emergency, the chief officer cannot afford to have anyone perform below peak performance level. A strong wellness program is vital to the development of a peak performance team” (Finney, 1998). In the United States Fire Administration publication, *Stress Management: Model Program for Maintaining Firefighter Well-Being*, stress control techniques

are discussed. There are two basic ideas behind stress control. One is that we can control or manage the amount of stress that we experience and the other is that we can change the quality of the stress that we experience. This involves learning to benefit from stress by changing negative stress into positive stress. The basic premise of this program is to educate firefighters about stress and help them to develop a personal stress management plan (1991).

Literature suggests that there are three basic ways to beat stress. The first would be to decide which stressors in your life can be minimized or eliminated. The second would be to change your attitude regarding the stressor. Try to be more relaxed and accepting. Third, get involved in stress management techniques in order to reduce the bodies physical response to stress. Stress management techniques are broken down into two categories: Mental or emotional stress management and physical stress management. Emotional techniques would include concepts such as decompression or unwinding appropriately after a shift, Talking with peers or a member of an Employee Assistance Program, having relationships outside of the fire service, taking time for yourself or a vacation, or keeping a journal. One of the most common physical stress management tactics is exercise. Regular exercise has many benefits including improved fitness levels and a sense of well-being. Regular aerobic exercise also reduces the risk factors for heart disease. USFA suggests other physical tactics such as biofeedback, progressive muscle relaxation, meditation and yoga (1991).

In light of the fact that 53% of fireground deaths are due to physical stress and exertion, we need to look more closely at how are firefighters are rehabilitated during strenuous incidents such as structure fires, hazardous materials responses, and lengthy technical rescue incidents. During arduous physical exertion at incidents and while wearing fully encapsulated bunker gear, firefighter's heart rates are increased significantly and the bodies core temperature rises well

above normal. This results in an average of 15 percent decrease in blood plasma volume (Burnett, 1998). As part of a physical stress management program, a comprehensive emergency incident rehabilitation (EIR) operation needs to be established. Below is a list of key components for an EIR as reported in *Journal of Emergency Medical Services*, November 2000.

- Keep all personnel well hydrated and rested
- Provide ongoing medical monitoring to watch for signs of stress and heat-related illnesses
- Immediately identify and treat any potentially serious conditions detected during monitoring
- Treat any traumatic injuries
- After rehabilitation and medical monitoring, triage personnel for: return to duty medically sound, or removed from duty with evidence of illness or injury, or transport to a medical facility for further evaluation and treatment

A final crucial component of a stress management program is having a system in place to deal with critical incident stress. As revealed earlier, critical incident stress, if left untreated, can cause many physical problems and illness in members of the fire service. An approach to dealing with this stress was developed originally for veterans returning from war. It dealt with critical incident and post traumatic stress in a psychotherapy format. Today, critical incident stress debriefing (CISD) is a reactive form of treatment performed by mental health professionals and specially trained peer support personnel. “The main objectives of CISD are to mitigate the impact of a critical incident and accelerate the return of personnel to routine functions after the incident” (Mitchell, 1988). CISD teams can be found in communities or regions across the United States.

Many of the sources in my literature review influenced this research by contributing to my background knowledge of the subject. This researcher has extended training and experience in critical incident stress debriefing and stress management.

In summary, firefighters, not only in the EDFD but across the country, work in an environment that is filled with a host of stressors. It must be a part of every fire service leader's focus to see that our firefighters are properly trained in stress education and can effectively manage stress to reduce the risks of CVD, maintain health in their careers and enjoy a long retirement.

Procedure

The revealing of what stressors firefighters in the EDFD encounter and what negative effects, if any, the stress has on their health was the desired result of this research project. Also, it is intended that the outcome will cultivate recommendations which would promote firefighter health and wellness through a screening process and stress management program. The descriptive research methodology was used to answer the research questions.

Several steps were used in carrying out this research project. The first step was to perform an extensive search and review of existing literature on stress, most notably occupational stress, and how it may be linked with cardiovascular disease. Also, statistics were gathered and studied regarding firefighter fatalities. These fatality reports were scrutinized for causal factors of the firefighter's death. Those reports which pointed to stress, exertion, heart attack, or stroke as the underlying cause were reviewed to attempt to determine factors which may have contributed to this fatal injury. Also, existing literature on cardiovascular disease was investigated to better understand the disease process and how stress may be linked as a risk factor.

Next, Administrative Policies, Department Directives, Suggested Operating Guidelines and Standard Operating Procedures of the EDFD were reviewed for policies on health and wellness, emergency incident rehabilitation, and stress management programs.

The next step in the process of my research was to employ two surveys. The first survey used was a popular *Life Events Inventory* (Appendix A). This survey was mentioned in several sources in my literature review. Holmes and Rahe (1971) introduced this survey as a way to look at what events in your life could be causing stress, what degree of stress, and whether you have an increased likelihood of illness. The respondent was asked to identify which life changes they have encountered over the last 12 months and tabulate a total score. The second survey (Kiffer, 2002) titled *Assess Your Stress* (Appendix B), asks the respondent to rate on a scale several physical effects of stress and tabulate a total score. Both surveys were conducted over approximately 60 days during this research project. The survey audience consisted of members of the EDFD including Captains, Lieutenants, career or full time firefighters, and call firefighters. Also, both surveys were distributed to members of the same ranks of two other neighboring fire departments to determine if there is a variation in results between departments. A total of 75 survey packages were distributed; 25 in each of the three departments. A draft test of the survey was performed.

The final addition to my research process was a “casual” observation of members of the EDFD. This was NOT a formal part of my research project. For my own benefit, to better understand reactions to stressful events, I was attentive to statements, actions and behaviors of the members of my department during and after what I considered to be stressful situations both in the firehouse and during incidents. There was no log or journal kept and no results were identified or concluded.

Limitations and Assumptions

The limitations of this research project were many; however, further research in this crucial area is needed and encouraged.

The main assumption in the literature review portion of this research is that the articles and studies chosen were unbiased and objective. Another limiting factor in the literature review was that there was a restricted amount of research on stress and cardiovascular disease exclusive to the fire service as opposed to the abundance of literature on the same subject in the general population. It is also important to note that NFPA, FEMA, and NIOSH conduct reports of on-duty firefighter fatalities and fail to look at those that occur off-duty or after retirement.

In regards to the surveys conducted, several limitations were noted. It is assumed that firefighters were accurate and honest when responding to the surveys. Also, when scoring stressful events, factors like personality and how one reacts to stress were not taken into account. A further limitation was the number of surveys distributed and returned. Nearly one third of the surveys distributed, 24 of the 75 were unaccounted for. There was no follow-up letter sent which may have contributed to the poor return rate. A larger number of surveys distributed among several departments in different areas of the country would have had more statistical significance and surveying departments of similar makeup and call volume would have added to the validity of the research. A further limitation of the survey portion of this research was that it didn't include Chief officers or fire administration. It is very possible that chiefs are just as stressed as the line personnel, but perhaps affected by a higher percent of organizational stress than physical exertion stress. Finally, one fault noted of the *Life Events Inventory* survey was that the directions for completing the survey did not include asking the respondent to circle or mark

the events that contribute to stress. Four of the 51 surveys returned simply had a total score tabulated and did not indicate the events that contributed to that score.

Results

Using the descriptive research methodology, a study was conducted and the results of this research study were employed to answer the four original research questions. Survey data and statistics are documented in Table 1 and Table 2.

1. What stressors do firefighters encounter in their daily lives?

A distinction was made in the types of stressors encountered by firefighters. The research defines a host of occupational stressors. Physical stressors such as heat stress, sleep deprivation, noise, toxins, dehydration, hypothermia and extreme physical strain were all identified. Emotional or psychological stress was discussed at length and includes traumatic stress and the separate, although closely related, critical incident stress brought on by witnessing death, severe injury or other intense circumstances over which the firefighter has no control. Another classification of occupational stressors identified was organizational in nature. This includes stress from rotating shift work, job security concerns, leadership conflicts and wages and benefits. Organizational factors were reported as being more stress evoking than other factors for firefighters according to the literature review. Finally, rapid onset stressors and cumulative stressors were defined and identified. Rapid onset stressors would include a sudden bright light, an unexpected loud noise or a sharp pain. The ‘life and death responsibility’ experienced by firefighters, as well as a poor work environment and “burn out” are all examples of cumulative stressors.

Daily life stressors were identified in the literature review also, but were more difficult to correlate with the stress encountered by firefighters. For this reason, the *Life Events Inventory*

was used. Of the 51 surveys returned, the average total score was 156 points with highest

Table 1

EDFD / 21 surveys

400			X-361
350			
300			
250			
200		X-158	
150			
100			
50	X-41		
Low score		Average	High

FD 1 / 14 surveys

400			
350			
300			
250			
200			X-180
150		X-149	
100	X-69		
50			
Low score		Average	High

FD 2 / 16 surveys

400			
350			
300			X-261
250			
200			
150		X-152	
100	X-78		
50			
Low score		Average	High

Table 1 displays the low, average and high score, by points, for stress events, encountered in life. The TOTAL average score for all 51 surveys returned was 156 points.

score being 361 points and the lowest was 41 points. This simple survey places the average firefighter from the sample at a 40% more likelihood of contracting an illness due to the amount of daily life stress calculated using the scoring system. This survey shows no statistical significance in the differences in the results from each department surveyed (Table 1).

2. What effects do those stressors have on their mental and physical well-being?

Each individual firefighter varies in perception of what causes stress. Also different personality types are affected differently by stress. There was overwhelming evidence in literature that stress can and does cause a physiological change in the body if left untreated. Signs and symptoms such as increased heart rate, increased blood pressure, difficulty breathing and extreme fatigue will reveal themselves. These stressors have also been shown to be linked to obesity, alcohol use, substance abuse, cigarette smoking and emotional instability.

At times during a firefighter's career, the physical demands placed on the body are at maximum levels. During fire suppression activities the body's core temperature rises, the heart pumps hard and fast to keep up with the demands of the muscles, the blood pressure rises and dehydration begins, resulting in heat stress and overexertion. This firefighter needs proper rehabilitation, including rest, water and electrolyte replacement and sufficient cooling before being released back to work. A firefighter who is not "fit for duty", that is, of low aerobic capacity and poor muscular strength, has been shown to be more affected by these strenuous demands.

As shown in Table 2, firefighters of the EDFD scored slightly higher than the other two departments on the *Assess Your Stress* survey. All three departments had an average score in the 20 to 30 points range indicating that stress could be starting to affect their health. In this scoring category, it was recommended to discuss stress management techniques with a healthcare

Avg.

Table 2

30			
28			
26	X		
24			
22			X
20			
18		X	
EDFD FD 1 FD 2			

Table 2 displays the average total score in points from each department

provider. Interestingly, statement #1 (I feel tired or have lack of energy.) and statement #7 (I have an upset stomach and muscle aches, especially in my back, neck, or shoulders.) ranked the highest in points across all 3 departments.

It appears that the firefighters surveyed do encounter a fair amount of daily life stress and that stress combined with occupational stressors inherent in the fire service can and do have some negative health affects. A long term study conducted by Psychologists and Medical Doctors including Cardiologists, would certainly give more definitive, measurable results. But based on my observations and relationships with members of the EDFD, my literature review,

and the results of the surveys conducted, it would be correct to say that the health and wellness of firefighters in the EDFD and other departments is impacted negatively by stress.

3. How does stress contribute to cardiovascular disease?

Both physical and emotional stress has been shown to cause physiological changes in the body. The more stressors you encounter that go unresolved or untreated, the less ability the body has to fight infection and disease. Prolonged or cumulative stress causes the body to release adrenalin and cortisone. Cortisone increases the blood pressure and causes small tears in the walls of the arteries which are repaired with cholesterol. This leads to arteriosclerosis and stress on the heart. High amounts of adrenalin from prolonged stress reactions have been shown to cause damage to the tissue of the heart and cause the blood to clot more readily increasing the risk of a heart attack.

Studies have shown that the greater the number of heart disease risk factors you have, the more likely you are to develop CVD and possibly suffer a cardiac event. People who live with chronic stress are more likely to suffer from obesity, take up smoking and be less likely to exercise therefore increasing the risk of CVD.

4. What support systems or training is necessary to recognize stress, reduce the impact of stress, and identify risk markers to prevent tragedies in the EDFD?

It is well known that firefighting is one of the most mentally and physically challenging careers in this country. The topic of health and safety of firefighters is focused on in several of the NFPA standards. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* (1997), addresses several of the issues discussed in the literature review. Chapter 8 specifically discusses medical and physical requirements of firefighters. Chapters 9 and 10 discuss wellness and critical incident stress programs.

After reviewing the literature from the medical community, the fire service community, including NFPA standards and USFA publications, and the mental health community, I have outlined a model program to be considered to help reduce the effects of stress and track the health of the members of EDFD.

1. Hire healthy firefighters

Adhering to NFPA 1582, *Medical requirements for Fire Fighters and Information for Fire Department Physicians* (2000), will help to ensure that the personnel are beginning their careers in a degree of health that meets the standard and also requires that current firefighters also meet that standard on an annual basis.

2. Require an entry and annual physical agility/ability test

Follow performance requirements set forth and allow for remediation or retraining for those members who no longer meet the level of performance

3. Appoint a health and fitness coordinator

The coordinator establishes a health and fitness program and acts as a link between the department and the department's designated physician.

4. Maintain confidential employee medical files

Files should contain all pertinent medical history, as well as injury and exposure reports. Any known heart disease risk factors, such as cholesterol levels, smoking, etc. should be documented.

5. Implement a Stress Management Program

Include aspects for emotional health such as employee assistance program and a critical incident stress program. Include training and seminars on topics such as stress education and recognition, smoking cessation, diet and nutrition and relaxation. Mandate a physical fitness section of the program.

6. Adopt Standard Operating Procedures for EIR

Establish procedures for a systematic approach to rehabilitate department members operating at emergency incidents. Follow NFPA 1561, *Standard on Fire Department Incident Management System* (1997), and include medical evaluation, treatment, cooling, food and fluid replacement and proper periods of rest.

Discussion

The results of this research suggest that there is some amount of association between occupational and other types of stress and the health effects which could lead to cardiovascular disease. The results of the *Life Events Inventory* survey revealed that a moderate amount of stress is experienced by firefighters in their daily lives in addition to that stress which is germane to the fire service. “ In addition to shouldering the effects of daily stress, firefighters are subjected to a great number of unusually powerful and potentially destructive stressors unique to their work” (USFA,1991).Also, the point scoring system revealed that the respondents were approximately 40% more likely to suffer illness as a result of the amount of stress reported. In answering research question 2, the *Assess Your Stress* survey touched on some of the signs and symptoms of stress and respondents were able to rate the severity by occurrence of those symptoms. The average scores for all three departments revealed that they are experiencing some signs and symptoms of stress and need to begin to explore a stress reduction program. Because each person is individual in how they perceive and are affected by stress, and because there are other risk factors to take into account, it is incorrect to conclude that firefighting causes heart attacks.

While it remains inconclusive whether firefighting greatly increases mortality from cardiovascular disease, it seems obvious that sudden stresses and strains placed on firefighters- especially older ones- lower the threshold for the possibility of heart attack,

stroke or minor ischemia, all of which could prevent our modern day heroes from saving the lives of others (Law, 2000).

While it would be impossible to remove the physical stressors encountered by firefighters performing their duty, the importance of reducing the effects of stress was made clear in the literature (Kales, Soteriades, Christoudias & Christiani, 2003) There was no shortage of books, articles, studies and reports on the concept of stress in the general population. In the firefighting community, however, the statistical data was scarce.

“Clearly, more studies on the subject are imperative. Health issues faced by firefighters, particularly those cardiac in nature, demand our attention” (Law, 2000).

The research and literature review created a greater understanding of the heart disease process and what risk factors lead up to CVD. Also, in reviewing NIOSH fatality reports, it became clear that many of the firefighters who succumbed to heart attacks had multiple risk factors and some had even had heart attacks in the past. Also, literature reviews on the concept of stress related illnesses gave me insight into just how widespread the problem is. “Severe or chronic stress can result in disease or death. In the United States, approximately 80% of all non-trauma deaths are caused by stress-related illnesses” (Bryce,2001).

The implications of the results of the research are many. First, because the EDFD is currently operating without some basic health and safety SOPs, such as an EIR procedure, a health and wellness program, and a health tracking system, the members of the EDFD may be at a greater risk for suffering the ill effects of occupational stress. Although only one known cardiac related death occurred in the EDFD over the last 35 years, that is still one death too many. That also leads to the question of when will the next one occur and who will it be? All of the research on firefighter fatalities points to cardiac-related events as the predominant cause of

firefighter deaths. More attention, time and money needs to be spent on this important area of research. Further implications for members of the EDFD include being more aware that some of the physical complaints and ailments, headaches and fatigue they experience may be the result of untreated stress. Also, being knowledgeable of cardiovascular disease risk factors and how the firefighters can reduce their chances of becoming a statistic is a step in the right direction for being able to enjoy a long retirement.

Recommendations

The East Derry Fire Department should review all SOPs and begin to draft and implement new procedures which deal directly with the health and wellness of its members. In order for this to be successful, the Fire Chief and Fire Commissioners need to recognize and support the need. Also, member participation in the drafting of the procedures will result in increased acceptance.

I would recommend that a health and safety officer or wellness officer research all of the latest material on emergency incident rehabilitation. There are new products available such as cooling chairs and new nutritional supplements which may benefit the firefighters during and after physically demanding incidents. “ Although firefighting remains an inherently hazardous, physically demanding occupation, emergency scene rehabilitation that incorporates medical monitoring and interventions can reduce the risk of stress- and heat-related illnesses and deaths”(Dickinson,2000, p.25).

The EDFD should immediately begin to put together a comprehensive health and wellness program. This program should consist of several components including a stress education and stress management program. With the guidance of a health and wellness coordinator, physical fitness should become a top priority. “Each year over 50% of the firefighters

who die in the line of duty succumb to heart failure and other stress related problems. Studies have shown that an increased level of fitness for firefighters can reduce the risk of these deaths; thus physical fitness is a critical aspect of firefighter health and safety” (USFA 1990, p.1). Aerobic conditioning, muscular strength and endurance should be focused on to keep the members of the EDFD “fit for duty”. Wellness classes and guest speakers on such topics as cholesterol levels, smoking cessation and diet and nutrition should be planned. A fire department physician should be designated to perform medical evaluations and screenings. Also a confidential medical file should be kept up to date with evaluation results, past medical history, documented recommendations and any illness or injury reports. Annual physicals should be included in the medical evaluation process.

Outside stress management sources such as employee assistance programs and critical incident stress programs have been rarely utilized by members of the EDFD. This resource should be readily available and encouraged.

At the present time, EDFD does employ a physical ability test for new recruits but does not administer any type of psychological screening. I would suggest researching types of screening tests, validity of those tests and if other fire departments are satisfied with that process. This type of screening would eliminate a candidate with underlying emotional or psychological problems.

My final recommendation would be to encourage further research into the trend of firefighter fatalities and to conduct studies into which occupational stressors have the most impact on the health of firefighters. Also, let’s keep a watchful eye in our own departments on the health and safety of our brothers and sisters.

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APPENDIX A

Major life changes that alter a person's social role and relationships, such as marriage, divorce, job change, serious illness, or death of a loved one, can increase susceptibility to stress especially when several of these changes occur within a brief time period. Multiple major life changes within one year correlate with a higher risk of injury or illness.

Find your score for the preceding 12 months

EVENT	SCORE
Death of a spouse	100
Divorce	73
Marital separation	65
Imprisonment	63
Death of a close family member	63
Personal injury or illness	53
Marriage	50
Dismissal from work	47
Marital reconciliation	45
Retirement	45
Change in health of family member	44
Pregnancy	40
Sex difficulties	39
Addition of new family member	39
Business adjustment	39
Change in financial status	38
Change in # of arguments with spouse	35
Major mortgage or loan	32
Foreclosure of mortgage or loan	30
Change in responsibilities at work	29
Children leaving home	29
Trouble with in-laws	29
Outstanding personal achievement	28
Partner begins or stops work	26
Change in living conditions	25
Change in personal habits	24
Trouble with the boss	23
Change in work hours/conditions	20
Change in residence	20
Change in school or college	19

Change in recreation	19
Change in church activities	19
Change in social activities	18
Minor mortgage or loan	17
Change in sleeping habits	16
Change in # of family meetings	15
Change in eating habits	15
Vacation	13
Christmas	12
Minor violations of the law	11

TOTAL SCORE: _____

Scores of:

150-199 points increase your likelihood of illness by 40%

200-299 points increase your likelihood of illness by 50%

300 and above increase your likelihood of illness by 80%

APPENDIX B

Assess Your Stress

Consider how you felt over the past six months and rate your response to the following statements:

1. I feel tired or have a lack of energy
2. I have trouble sitting still or concentrating
3. I have problems getting to or staying asleep at night
4. I feel pain in my chest and shortness of breath
5. I am constipated or have diarrhea
6. I feel nervous, and shake or sweat a lot
7. I have an upset stomach and muscle aches, especially in my back, neck and shoulders
8. I have headaches
9. I smoke and/or drink alcohol
10. I have gained or lost more than 10 pounds

SCORING:

10-20 points- This score suggests that you have a low level of stress or you are managing stress.

Be aware of the signs and symptoms of stress.

20-30 points- This score suggests that stress may be starting to affect your health. You may want to discuss stress management techniques with your healthcare provider.

30-40 points- Stress is starting to affect your health in a negative way.

40-50 points- You are at risk for stress-related illnesses and it's time to take action. See your doctor.